

# Yield and Yield Contributes of Coriander (*Coriandrum Sativum L.*) as Influenced by Spacing and Variety

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**Abstract-** The study was conducted at the Sher-e-Bangla Agricultural University farm, Dhaka, Bangladesh during the *rabi* season of 2011-2012 to find out the Yield and yield contributes of coriander (*Coriandrum sativum L.*) as influenced by spacing and variety. The experiment consisted varieties, spacing and their combination viz., spacing of 30 cm x 10 cm produced the maximum seed yield (2.01t ha<sup>-1</sup>) which was statistically similar with 20 x 15 cm (1.99 t ha<sup>-1</sup>), 25 cm x 10 cm (1.94 t ha<sup>-1</sup>) and 20 x 10 cm spacing (1.95 t ha<sup>-1</sup>) following randomized complete block design (RCBD) with three replications. The variety BARI Dhonia 1 gave higher values compared to Faridpur local. The variety Faridpur local in combination with 30 x 10 cm spacing gave the highest seed yield (2.16 t ha<sup>-1</sup>) identical with 25 cm x 10 cm spacing with the same variety Faridpur local (2.10 t ha<sup>-1</sup>).

**Index Terms-** Coriander (*Coriandrum sativum L.*), Yield, Spacing and variety.

## I. INTRODUCTION

Coriander (*Coriandrum sativum L.*) belonging to the family *Apiaceae* is an important spice crop in Bangladesh which is normally cultivated in winter (*rabi*) season. In Bengali it is known as 'Dhonia'. Coriander is native to South Europe and the Mediterranean region, and is extensively grown in Russia, Bulgaria, Mexico, USA, Argentina, China, Romania, Italy, Japan, Hungary, Poland, Czech, Morocco and India and has been cultivated since human antiquity (Tiwari and Agarwal, 2004). It is also described as a native to southern Europe and Asia Minor. Precisely Italy is presumed as the native place of coriander (Thumburaj and Singh, 2004). The entire plant of young coriander is used as appetizer in preparing fresh chutneys and sauces, leaves are used to flavour food, curries, soups, fish sauce, and cream sauce for chicken, tomato soup, pickling sausages, bakery preparations, liqueurs, gins and meat. Seeds are used in pastry, cookies, cakes, soups, sausage, pickles, curries, in preparation of curry powder. Essential oil like oleoresin is used for flavouring beverages, pickles, chocolates, sauces etc. Seeds and essential oils are used to scent perfumes, deodorants and soaps. They are also used in seasonings for sausage and other meat products. (Janardhanan and Thoppil, 2004; Tiwary and Agarwal, 2004).The seeds are also used in medicine as a carminative, refrigerant, diuretic and aphrodisiac. It is used in the preparation of many household medicines to cure bed cold, seasonal fever, nausea, vomiting and stomach disorder. Pharmaceutical use of coriander is to mask the taste of other

medicinal compounds or to calm the irritating effects on the stomach that some medicines cause (Sharma and Sharma, 2004).Coriander leaves and seeds are valued as food mainly for its high Vit. A and Vit. C. Its leaves contain 88% water, 32 kcal, 6.0 g CHO, 2.7 protein, 0.5 g fat, 1.0 g fiber and 1.7 g ash , 150 mg. C, 0.01 mg B1, 0.01 mg B2, 1.0 mg Niacin, 150 mg Ca, 55 mg P, 540 mg K, 6 mg Fe per 100 g fresh weight of leave and 10, 000 I.U. Vit. A (Rubatzky *et al.*, 1999). On the contrary coriander seed contains 11.4% water, 22.7 g CHO, 11.5 g protein, 19.1 g fat, 28.4 g fiber, 500 mg P, 12 mg Vit. C per 100 g of fresh seed, 175 IU Vit. A (Pruthi, 1998). It is well known that establishment of an optimum plant density per unit area is one of the most important factors contributing to the increased productivity of a crop. Plant spacing controls the plant density of the crop. Wider or too low spacing beyond the optimum can affect the yield of crop. Besides cultivar itself plays a great role in cultivation of the crop. Before reaching the hand of the farmers, the cultivars/varieties must be tested for its yield potential.

## II. MATERIALS AND METHODS

The experiment was conducted at the Sher-e-Bangla Agricultural University (SAU), Dhaka, Bangladesh during Rabi (November – February), 2012 to study the yield performance of Coriander in response to plant spacing and variety. The experiment consisted six levels of spacing and two varieties and their interaction were used in the experiment viz. 20 x 10 cm(S<sub>1</sub>), 25 x 10 cm(S<sub>2</sub>), 30 x 10 cm (S<sub>3</sub>), 20 x 15 cm (S<sub>4</sub>), 25 x 15 cm (S<sub>5</sub>), 30 x 15 cm (S<sub>6</sub>) and two varieties viz. BARI Dhonia-1 (V<sub>1</sub>) and Local (Faridpur) (V<sub>2</sub>) followed by randomized complete block design (RCBD) having twelve treatments with 3 replications. The size of unit plot was 3 m x 1.8 m. The total number of treatments was (6 Levels of population density × 2 varieties) 12 and the number of plots were 36. The land was opened by disc plough 15 days before seeding. Thereafter, the land was prepared thoroughly by ploughing and cross ploughing followed by laddering and harrowing to have good tilth.

### Fertilizer application

Manures and fertilizers were applied at the following doses as par Anon., 2001:

Nutrient/Fertilizer	Dose/ha
Cowdung	10 ton
Nitrogen	80 kg
Phosphorus	35 kg

Potassium	60 kg
Sulphur	20 kg

The entire amount of Cowdung, phosphorus from TSP, and potassium from MP, Sulphur from Gypsum with one-half of nitrogen and applied during final land preparation. The rest of the nitrogen was applied in two equal splits at 30 and 60 days after sowing of seeds as top dress.

**Sowing:** The seeds were sown in rows 20 cm apart continuously by hand @ 40 kg/ha. To allow uniform sowing in rows seeds were mixed with some loose soil (about four to five times of weight of seeds). The sowing was done on November 14, 2012 with slight watering just to supply sufficient moisture needed for quick germination.

**Intercultural operations:** The desired population density was maintained by thinning plants 15 days after emergence. Irrigation, mulching, weeding and plant protection measures etc. were performed as needed to uniform germination, better crop establishment and proper plant growth. The field was kept free by hand weeding. First weeding was done after 25 days after sowing (DAS). Four irrigations were given at 20, 30, 60 and 90 days after sowing.

**Harvesting:** Seeds were harvested when half of the fruits on the plant changed from green to brown colour as suggested by Singhania *et al.* (2006). To avoid shattering of fruits, harvesting of seed plant was cut to the base by sickles in the early morning. seeds (grains) were separated by beating with sticks and cleaned by winnowing and dried properly (10% moisture of seed).

**Collection of data:**

Plant height at bolting (cm): Plant height was measured at bolting in centimeter from the base (rosette) of the plant up to the tip of the longest leaf with the help of a meter scale from randomly selected 10 plants from each plot. The mean of 10 plants were counted as plant height.

Number of primary branches plant<sup>-1</sup>: Average number of branches produced by randomly selected 10 plants per unit plot.

Number of secondary branches plant<sup>-1</sup>: Average number of branches which were developed from primary branches, from randomly selected 10 plants per unit plot.

Number of umbels plant<sup>-1</sup>: Average number of umbels produced by 10 plants per unit plot.

Umbel circumference and diameter (cm): Five umbels were considered for recording this data. At first circumference of umbel at flower condition was circled by a piece of thread and then the length of thread was measured by meter scale. The half

of this measurement was taken and the average data was taken and the average data was taken as umbel diameter.

No. of umbellates umbel<sup>-1</sup>: Five umbels of each of selected plants were considered for recording this data.

No. of seeds umbel<sup>-1</sup>: Five umbels of each of selected plants were considered and then seeds per umbel were counted from all the umbels and the average data were taken as number of seeds/umbel.

No. of seeds umbellate<sup>-1</sup>: Five umbels of each of selected plants were considered and then seeds per umbellate were counted from all the umbellate and the average data were taken as number of seeds/umbellate.

No. of seeds plant<sup>-1</sup>: Average number of seeds produced by 10 plants.

Dry seed yield plant<sup>-1</sup> (g): The average weight of dry seeds harvested from 10 randomly selected plants per unit plot.

Dry seed yield plot<sup>-1</sup> (g): The average weight of dry seeds harvested from per unit plot.

Thousand seed weight (g): At first 1000 dry seeds were randomly counted from each treatment. Then weight of 1000 seeds was recorded with the help of an electric balance in the laboratory from the collected dry seeds.

Dry seed yield (t/ha): After maturity seeds of all plots were harvested, cleaned and dried. First seed weight plant was measured with an appropriate spring scale balance and thus plot yield was converted to yield per hectare in tons.

Stover yield (straw yield) plot<sup>-1</sup> (g): The average weight of straw harvested from per unit plot.

Stover yield (straw yield) (t/ha): After seed harvested all plant stalks per plot were dried and weight was taken. Then plot stover yield was converted to per hectare yield.

Collected data were analyzed statistically by F-test to examine whether the treatment effects were significant. The mean comparisons of the treatments were evaluated by DMRT (Duncan's Multiple Range Test). The analysis of variance (ANOVA) for different parameters was done by a computer package programme 'MSTAT'C.

III. RESULTS AND DISCUSSION

**Plant height**

Plant height was not significantly varied by varieties. Though the highest plant height was obtained by BARI Dhonia 1 (81.853 cm) while for Faridpur local it was recorded 80.367 cm (Table 1). Bhandari and Gupta (1993) conducted an experiment with 200 hundred genotypes of coriander and reported that plant height ranged from 11.8-86.1 cm. Datta and Choudhuri (2006) reported that 17 germplasm lines of coriander got plant height ranged from 42.87-98.77 cm.

**Table 1. Effect of variety on yield attributes of Coriander**

Variety	Plant height (cm)	No. of primary branches plant <sup>-1</sup>	No. of secondary branches plant <sup>-1</sup>	No. of umbels plant <sup>-1</sup>
BARI Dhonia-1	81.85	7.06	15.84	32.17 a

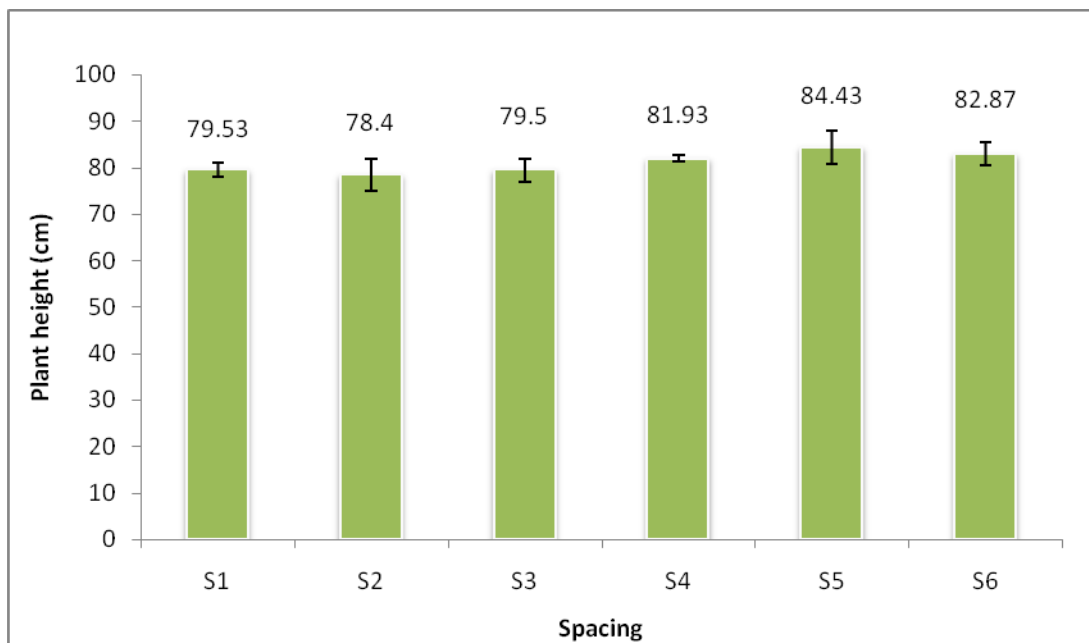
Faridpur local	80.37	6.99	15.85	31.64 b
CV (%)	2.88	6.42	3.62	1.89%
Level of significance	ns	ns	ns	*

Level of significance means in a column having different letters are significant by DMRT. ns = Non-significant,\* = Significant at 5% probability,

**Effect of spacing**

The result revealed that the plant height decreased as the plant to plant spacing decreased. The plant height of 15 cm plant

to plant spacing was higher than 10 cm plant to plant spacing. Verzalova et al (1988) reported that row spacing of fennel did not effect on the plant height. Masood et al (2004) investigated that the greatest plant height were obtained with the lowest row spacing.



**Figure 1. Effect of spacing on the plant height of coriander.**

**Number of primary branches plant<sup>-1</sup>**

BARI Dhonia 1 produced the highest number of primary branches plant<sup>-1</sup> (7.06) and the lowest number of primary branches plant<sup>-1</sup> (6.99) was produced by the variety Faridpur local. Bhandari and Gupta (1993) reported that the primary branches per plant ranged from 1.4-8.6 among 200 genotypes. Rahman (2000) also got primary branches per plant which ranged from 6.10-8.02. Datta and Choudhuri (2006) reported that 17 germplasm lines of coriander produced primary branches/plant from 5.37-8.23. Srivastava *et al.* (2000) produced no variability among primary branches.

The maximum number of primary branches plant<sup>-1</sup> (7.70) was produced by the interaction effect of BARI Dhonia 1 with 20 cm x10 cm spacing. But it showed similar result with V<sub>2</sub>S<sub>1</sub>, V<sub>1</sub>S<sub>2</sub>, V<sub>1</sub>S<sub>6</sub> and V<sub>2</sub>S<sub>5</sub> treatment. The lowest number of primary branches plant<sup>-1</sup> was produced by the interaction effects of BARI Dhonia 1 with 30 cm x10 cm spacing.

**Number of secondary branches plant<sup>-1</sup>**

There was no significant variation in number of secondary branches plant<sup>-1</sup> among the varieties (Table 1). The variety BARI Dhonia 1 produced secondary branches plant<sup>-1</sup>(15.84), while the variety Faridpur local produced secondary branches plant<sup>-1</sup> (15.85).

Datta and Choudhuri (2006) reported that 17 germplasm lines of coriander produced secondary branches plant<sup>-1</sup> from 10.10-16.75. Rahman (2000) reported that secondary branches plant<sup>-1</sup> ranged 15.85-25.50 in coriander. The spacing of (30 cm x 15 cm) produced the highest number of branches plant<sup>-1</sup> (17.17). The closer spacing (20 cm x10 cm) produced the lowest number of secondary branches plant<sup>-1</sup> (14.68). The wider row spacing produced higher number of primary branches plant<sup>-1</sup> which might be due to less interplant competition for light, space nutrients and environmental resources.

**Number of umbels plant<sup>-1</sup>**

The highest number of umbels plant<sup>-1</sup> (32.172) was produced by the variety BARI Dhonia 1 and the lowest by the variety Faridpur local produced (31.64) umbels plant<sup>-1</sup>. Islam *et al.* (2004) reported that number of umbels plant<sup>-1</sup> ranged from 24.10-33.70. Anon. (2002) reported that the range of number of umbels per plant was 24.10-33.70 at Magura and 62.13-69.93 at Gazipur. Maurya (1989) got umbels per plant in the range of 17.00-41.67 while Datta and Choudhuri (2006) obtained from 20.83-34.67. Bhandari and Gupta (1993) reported the range of number of umbels per plant from 3.2-39.3.

The variety had no significant effects on number of umbellates umbel<sup>-1</sup> (Table 2). BARI Dhonia 1 produced (4.59) umbellates umbel<sup>-1</sup> while Faridpur local produced (4.80) umbellates umbel<sup>-1</sup>. Both the varieties were statistically similar in umbellates umbel<sup>-1</sup>.

Islam *et al.* (2004) did not find significant variation among genotypes in respect of number of umbellate per umbel. It was 7.43-7.80 at Gazipur (Anon 2002). Maurya (1989) obtained the number of umbellates per umbel in the range of 4.0-9.40. The result of this investigation corroborates the results of Maurya (1989).

**Number of umbellates umbel<sup>-1</sup>**

**Table 2. Effect of variety on yield attributes of Coriander.**

Variety	No of umbellates umbel <sup>-1</sup>	No of Seeds umbel <sup>-1</sup>	No of seeds umbellate <sup>-1</sup>	Umbel circumference (cm)
BARI Dhonia-1	4.86	37.58 a	6.84 a	21.62
Faridpur local	4.80	35.29 b	6.46 b	21.68
CV (%)	5.51%	4.02%	5.04%	8.02
Level of significance	ns	**	**	ns

Level of significance means in a column having different letters are significant by DMRT, \*\* = Significant at 1% probability, ns = Non-significant

**Number of seeds umbel<sup>-1</sup>**

There was a significant variation in number of seeds umbel<sup>-1</sup> between two varieties (Table 2). The number of seeds umbel<sup>-1</sup> (37.58) produced by the variety BARI Dhonia 1 was the highest. The minimum seeds umbel<sup>-1</sup> (35.29) was produced by the variety Faridpur local. Maurya (1989) recorded 28.00-46.00 seeds per umbel. Datta and Choudhuri (2006) got the seeds per umbel in the range of 33.47-35.57. The result under study is in partial fulfillment of Maurya (1989) and Datta and Choudhuri (2006).

**Number of plants plot<sup>-1</sup>**

There was no significant variation in number of plants plot<sup>-1</sup> (5.4 m<sup>2</sup>) (Table 4). In a plot having size of 5.4 m<sup>2</sup>, BARI Dhonia 1 had 179.5 plants while Faridpur local had 176.8 plants. Both varieties are statistically similar in number of plants plot<sup>-1</sup>.

**Table 3: Effect of variety on yield and yield attributes of Coriander**

Variety	No. of plants plot <sup>-1</sup>	Seed yield plant <sup>-1</sup> (g)	Seed yield plot <sup>-1</sup> (g)	No. of seeds plant <sup>-1</sup>
BARI Dhonia-1	179.5	10.75	1028.0	955.7
Faridpur local	176.8	10.67	1053.0	967.5
CV (%)	5.62	7.49	5.37	6.44

Level of significance	ns	ns	ns	ns
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Level of significance means in a column having different letters are significant by DMRT. ns = Non-significant.

### 1000-seed weight

The highest 1000-seed weight (10.74 g) was produced by the variety BARI Dhonia 1. The lowest 1000-seed weight (8.92 g) was produced by the variety Faridpur local.

Islam *et al.* (2004) obtained 1000-seed weight in the range of 10.25 to 11.73 g. Maurya (1989) got 1000-seed weight from 8.82-18.52g and Datta and Choudhuri (2006) from 9.33-13.82g. The result regarding 1000-seed weight of the present study was in the range of all authors.

### Seed yield (t/ha)

The highest seed yield (1.949 t/ha) was recorded from Faridpur local while BARI Dhonia 1 gave seed yield 1.903 t/ha. Rajagopalan *et al.* (1996) obtained seed yield of 13 coriander cultivars in the range of 0.36-0.68 t/ha at the Tamil Nadu Agricultural University, Coimbatore, India. Datta and Choudhuri (2006) reported that seed yields of 17 germplasm lines were in the range of 0.69-1.51 t/ha. Anon (2002) reported that four lines of coriander produced seed yield in the range of 0.98-1.24 t/ha in Gazipur while CR0022 gave highest yield 1.95 t/ha while BARI Dhonia 1 produced 1.80 t/ha, which support the present study result that Faridpur local produce highest result.

## IV. CONCLUSION

There was no significant difference between two coriander varieties, BARI dhonia-1 and Faridpur local in respect of most of the yield parameters and seed yield. The spacing of 30 cm x 10 cm gave the maximum coriander seed yield identical with 20 cm x 15 cm spacing. The variety Faridpur local in combination with 30 cm x 10 cm spacing gave the highest seed yield of coriander closely followed by 25 cm x 15 cm spacing with the same variety Faridpur local. The variety BARI Dhonia-1 coupled with spacing of 20 cm x 10 cm produced the identical seed yield.

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